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THE annual volume of Papers of the Michigan Academy of Science, Arts and Letters is issued under the joint direction of the Council of the Academy and of the Executive Board of the Graduate School of the University of Michigan. The editor for the Academy is Paul S. Welch; for the University, Eugene S. McCartney.

Previous publications of The Michigan Academy of Science, now known as The Michigan Academy of Science, Arts and Letters, were issued under the title, Annual Report of the Michigan Academy of Science. Twenty-two volumes were published, of which those numbered 1, 21 and 22 are out of print. Copies of the other volumes are still available for distribution and will be sent on exchange so long as the editions last. Applications for copies should be addressed to the Librarian of the University of Michigan.

Annual Reports embracing the proceedings of the Academy will, however, continue to be published. Applications for copies should be addressed to the Librarian of the University of Michigan.

MICHIGAN ACADEMY OF SCIENCE,
ARTS AND LETTERS

VOLUME IV

PART II

A KEY TO THE SNAKES OF THE UNITED STATES, CANADA AND LOWER CALIFORNIA

THE MACMILLAN COMPANY
NEW YORK BOSTON CHICAGO
ATLANTA SAN FRANCISCO

MACMILLAN & CO., LIMITED
LONDON BOMBAY CALCUTTA
MELBOURNE

THE MACMILLAN CO. OF CANADA, LTD.
TORONTO

PAPERS

OF THE

MICHIGAN ACADEMY OF SCIENCE ARTS AND LETTERS

EDITORS

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New York

THE MACMILLAN COMPANY

LONDON: MACMILLAN & COMPANY, Limited

1925

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Set up and printed,
February, 1925

PRINTED IN THE UNITED STATES OF AMERICA

NOTE

The *Key to the Snakes of the United States, Canada and Lower California* was presented before the Section of Zoölogy of the Michigan Academy of Science, Arts and Letters at the annual meeting of 1924. That the paper might be in convenient form for quick reference by herpetologists and by others of more general interests, it was deemed advisable to print and bind it separately.

The Editors

PREFACE

The absence of any general reference work for the accurate determination of the species of North American snakes induced the writer to undertake the preparation of a key to all the species and subspecies of snakes in North America, north of the Rio Grande. Lower California was included in order to make the area covered coincident with that selected by Stejneger and Barbour for their recent *Check List of North American Amphibians and Reptiles.*

The purpose behind the work has been to provide: (1) a simple means for the prompt and accurate identification of any snake in this region, without the necessity for dissection, or for examination of teeth; (2) a synopsis of the genera and species inhabiting the area; and (3) as accurate a determination as possible of the distribution of each species and subspecies. Certainty of identification has not been sacrificed to brevity, but that the key will fail in some instances is to be expected from the great individual variation in the scale characters of snakes.

The greater portion of the key is based almost exclusively upon the writer's personal examination of specimens in various museums, chiefly those in the United States National Museum; but of the genera Coluber, Crotalus, Pituophis and Thamnophis he has, for various reasons, made no critical study. A preliminary synopsis of the genus Coluber [1] has been kindly furnished by Mr. A. I. Ortenburger, who has now nearly completed a detailed study of these snakes. The key to the genus Thamnophis has been adapted, with slight alteration, from the studies of Ruth-

[1] The genus Coluber as currently understood has been divided by Ortenburger (Occ. Pap. Mus. Zoöl., Univ. Michigan, No. 139) into a restricted genus Coluber to include the "*constrictor*" group, and Masticophis to include the other "racers" and the "whip-snakes." Pending publication of the detailed evidence on which this separation is based, the author has adopted Ortenburger's classification.

ven and of Van Denburgh. The arrangement of the gopher snakes, Pituophis, has been taken from Van Denburgh and various eastern authors; that of the rattlesnakes, Crotalus, has been adapted from Stejneger and later writers.

The ranges have been determined largely on the basis of the specimens in various museums, and of published records. This work has brought out the value of local lists when compiled by trustworthy authors, and particularly when accompanied by detailed descriptions of the specimens upon which the lists are based.

The arrangement of genera is according to systematic standards in the main, but this order has been sacrificed in many cases to the convenience of the user of the key.

Further information on the snakes may be obtained from the selected list of references at the end. Here are included recent general works and such of the latest local lists as are more or less complete.

The basis of the nomenclature used is the Stejneger and Barbour *Check List.* No attempt has been made to verify the validity of scientific names except in genera of which the writer has made a special study, i.e., Natrix, Diadophis, Virginia, Carphophis and Lampropeltis. Occasional names, however, have been revived or omitted as has seemed necessary. For example, the writer cannot find a valid basis for the recognition of two species or subspecies of Hypsiglena; nor can he distinguish a Texas form of Elaphe of the *obsoleta* group, generally called *E. obsoleta lindheimeri;* nor does *Thamnophis ordinoides biscutatus* seem to him to be more than a local emphasis upon a variation wide-spread in *T. ordinoides vagrans* and *T. ordinoides ordinoides;* nor does he see anything in *Crotalus goldmani* but a synonym of *C. mitchellii.* To the writer, a species is a population of similar individuals of similar habits, freely interbreeding and maintaining a high degree of constancy in most superficial as well as in all fundamental details throughout a generally considerable area. An unusual local emphasis on minor features is not regarded as of taxonomic significance. A subspecies is of the same nature as a species except that it intergrades with a closely allied race in a relatively narrow area where the two ranges adjoin.

There are recognized in this key one hundred and ninety-one species and subspecies of North American snakes, exclusive of continental Mexico and Central America, but many changes in our understanding of these genera and species are inevitable. In many cases further knowledge of variation, distribution, habits and relationships awaits the slow discovery of more specimens. Such instances are the genera Phyllorhynchus, Sonora, Chilomeniscus, Stylophis, Liodytes and Seminatrix, and the species *Elaphe bairdi, E. subocularis, Lampropeltis alterna* and *Ficimia cana*. Many genera which are common are, however, still little understood. Of these, museums already have on hand fairly extensive collections ready to serve as a basis for systematic and distributional studies, and an understanding of their natural history awaits only the necessary field observations. Particularly in need of study are the snakes of such common genera as Elaphe, Natrix, Pituophis, Crotalus and Micrurus. These will all repay well in interesting results whoever will take up their investigation. Revisional studies, to attain their highest aim, will not be limited by a region, but by a natural biological unit, such as the genus, and they will not be confined to analytical and descriptive work alone, but will attempt to explain distribution and will use every means to arrive at an understanding of relationships.

In its present form this key would have been quite impossible without kindly advice on many details and a generous provision of material for study. For these courtesies the writer wishes to mention in particular Dr. Leonhard Stejneger and Miss Doris M. Cochran of the United States National Museum, Professor Alexander G. Ruthven and Mrs. Helen Thompson Gaige of the Museum of Zoölogy of the University of Michigan, Dr. Thomas Barbour of the Museum of Comparative Zoölogy, and Dr. G. Kingsley Noble of the American Museum of Natural History. To Dr. Frieda Cobb Blanchard the writer is indebted for the preparation of nearly all of the drawings and for advice and criticism throughout the development of the work.

Frank N. Blanchard

University of Michigan

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A KEY TO THE SNAKES OF THE UNITED STATES, CANADA AND LOWER CALIFORNIA *

This Key is arranged in the conventional dichotomous form. The specific name, therefore, of any snake occurring within the geographical limits given above may be found by selecting the correct one of the two alternatives offered, proceeding to the choice indicated by the number at the right hand margin, and repeating this procedure until the name is reached. Family names are included incidentally at the appropriate places. The range or distribution of the species will be found in parentheses directly below the specific name. Since the figures are intended primarily to illustrate technical terms and special details of scalation, the legends under them give merely the specific names. For the description of a figure, including the place where the specimen was collected, the museum where it is deposited, its museum number, and its magnification, reference should be made to the List of Illustrations, pages 59–62. Full explanation of the meanings of technical terms will be found in the Glossary on pages 55–56.

1. Ventral scales larger than dorsal scales and elongated transversely..... 4
   Ventral scales like dorsal, not transversely elongated. 2

2. Tail conspicuously flattened laterally for swimming. Sea snakes.....Disteiridae. *Pelamydrus platurus* (Linné). (Tropical Pacific and Indian oceans; Gulf of California near Espiritu Santo Island.)
   Tail rounded — not flattened for swimming. Leptotyphlopidae. 3

* Contribution from the Zoölogical Laboratory of the University of Michigan.

3. Supraoculars present (Fig.1).
Leptotyphlops dulcis (Baird & Girard).
(Northern Mexico, Texas, Oklahoma and New Mexico.)
Supraoculars absent (Fig. 2).
Siagonodon humilis (Baird & Girard).
(Deserts of Arizona, southern California, Lower California and northwestern Mexico.)

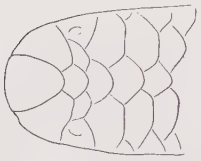

FIG. 1. *Leptotyphlops dulcis*

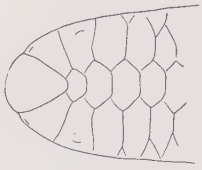

FIG. 2. *Siagonodon humilis*

4. No pit between eye and nostril (Fig. 3)..... 5
Deep pit between eye and nostril (Fig. 4) . . Crotalidae 186

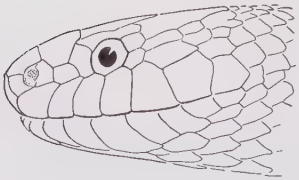

FIG. 3.
Lampropeltis triangulum triangulum

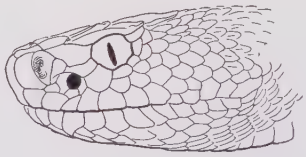

FIG. 4.
Sistrurus catenatus catenatus

5. One or two pairs of enlarged, elongated shields on chin between lower labials; tail never decidedly blunt; pupil usually round (Fig. 5)
Colubridae and Elapidae 8
Scales on chin between lower labials all small; tail short, blunt, with undivided caudals, pupil vertical (Fig. 6).....Boidae. 6

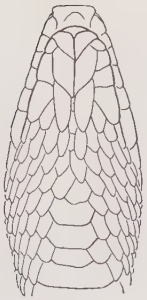

FIG. 5.
Salvadora grahamiae grahamiae

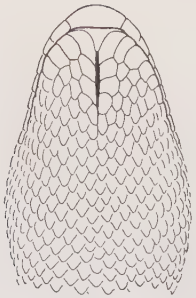

FIG. 6.
Charina bottae

6. A large median shield on top of head between eyes (Fig. 7). Rubber snake.....*Charina bottae* (Blainville). (Humid districts of California, Nevada, Idaho, Montana, Utah, Oregon and Washington.)
   Numerous small scales on top of head between eyes (Fig. 8).....Lichanura. 7

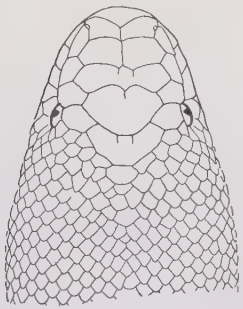

FIG. 7. *Charina bottae*

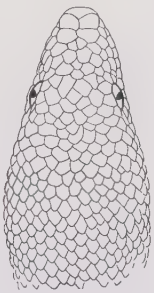

FIG. 8. *Lichanura roseofusca*

7. Ventrals more numerous, about 220–243; longitudinal bands, when present, not dark chocolate or blackish brown, and not in strong contrast with the ground color .....*L. roseofusca* Cope. (Southern California, northern Lower California and Arizona.)

Ventrals fewer than 220; light with dark brown longitudinal bands in strong contrast.....*L. trivirgata* Cope. (Southern Lower California.)

8. Keels present on some or all of dorsal scales of body or tail (Fig. 9) 9
Dorsal scales smooth on body and tail (Fig.10)..... 87

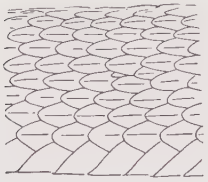

Fig. 9.
Dorsal scales with keels

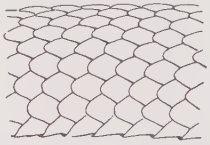

Fig. 10.
Dorsal scales without keels

9. Anal plate divided (Fig. 11)..... 10
Anal plate not divided (Fig. 12)..... 54

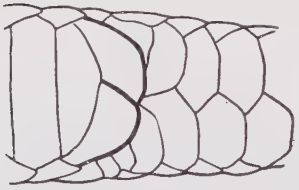

Fig. 11. Divided anal plate

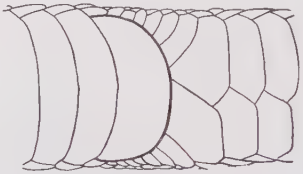

Fig. 12. Undivided anal plate

10. Rostral normal, not turned up in front and not keeled above (Fig. 13)..... 14
Rostral turned up in front and keeled above (Fig. 14). Spreading adder.....Heterodon. 11

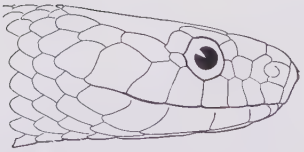

Fig. 13.
Diadophis punctatus edwardsii

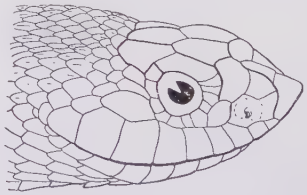

Fig. 14. *Heterodon contortrix*

11. Prefrontals in contact; under side of tail generally conspicuously lighter than abdomen (Fig. 14). 12
Prefrontals separated by small scales and often much reduced; under side of tail not conspicuously lighter than abdomen (Fig. 15)..... 13

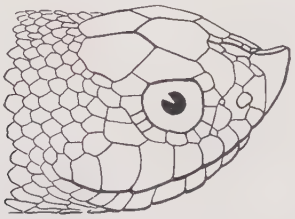

FIG. 15. *Heterodon simus*

12. Internasals separated by a small scale, the azygous; about 20–31 light cross-bars on body, or nearly black above (Fig.14).....*H. contortrix* (Linné). (Eastern Montana to Massachusetts, south into central Florida and west to central Texas and western Kansas.)
Internasals in contact, no azygous scale; about 16–19 light cross-bars on body.....*H. browni* Stejneger. (Southern Florida.)

13. Scale rows, 23; dorsal spots on body about 24–45; under side with much black.....*H. nasicus* Baird & Girard. (Arizona to Montana, east to western Iowa, and south through Texas into northern Mexico.)
Scale rows, 25, rarely 27; dorsal spots on body about 22–26; under side more or less obscurely checked but generally not largely black (Fig. 15)
H. simus (Linné).
(Indiana and northern North Carolina to northern Florida.)

14. Loreal present (Figs. 13 and 16) 17
Loreal absent (Fig. 17).....Storeria. 15

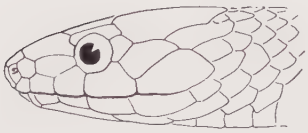

FIG. 16. *Potamophis striatulus*

FIG. 17. *Storeria occipito-maculata*

15. Scale rows, 17.....S. *dekayi* (Holbrook).
(Southern Maine west through the Lower Peninsula of Michigan to central Minnesota and central Kansas and south, except peninsular Florida, to the Gulf of Mexico, and along the Mexican coast as far as Vera Cruz.)
Scale rows, 15. 16

16. Belly reddish without spots, dorsal color generally extending well onto ends of ventrals; upper labials, 6 (rarely 7); ventrals, 116–133 (Fig. 17). Red-bellied snake.....*S. occipito-maculata* (Storer).
(From central Maine west through Wisconsin, Iowa, and eastern Kansas, and south through Alabama and Georgia to north central Florida, avoiding the lowlands of the coasts of the Carolinas and of the Mississippi Valley as far north as southern Illinois.)
Belly pale with a row of small black spots along each side, dorsal color extending only slightly onto ends of ventrals; upper labials, 7; ventrals, 138–150.
S. victa Hay.
(Florida and southeastern Georgia.)

17. Two internasals (Fig. 18)..... 20
One internasal (Fig. 19)..... 18

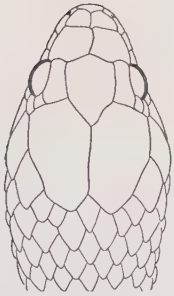

FIG. 18. *Virginia valeriae elegans*

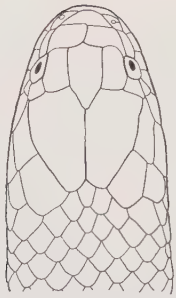

FIG. 19. *Farancia abacura*

18. Upper labials, 5; lower labials, 6; body scales keeled; scale rows, 17 (Fig. 16). . . . *Potamophis striatulus* (Linné). (Virginia to northern Florida, west in Texas and Oklahoma to the 98th meridian, and north in the Mississippi Valley to central Missouri.)
    Upper labials, 7 or 8; lower labials, 8–10; body scales nearly or quite smooth; scale rows, 19 or 21 19

19. No preocular; loreal meeting eye; nasals separated by rostral and internasal; ventrals about 172–196 (Fig. 19). Horn snake. . . . . *Farancia abacura* (Holbrook). (Virginia to Florida and Texas, in the Mississippi Valley northward to southern Indiana.)
    One preocular; loreal not reaching eye; nasals meeting in midline, separating rostral and internasal; ventrals about 118–124 (Fig. 20).
    Liodytes alleni (Garman).
    (Southern Georgia and Florida.)

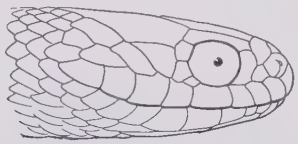

FIG. 20. *Liodytes alleni*

20. One or two preoculars present (Fig. 21)..... 24
No preocular; loreal in contact with eye (Fig. 22).... 21

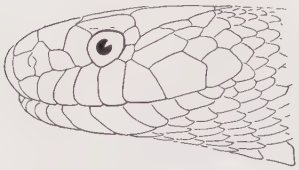

FIG. 21. *Elaphe vulpina*

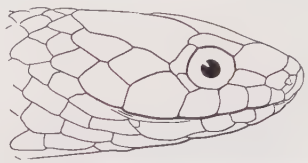

FIG. 22. *Virginia valeriae valeriae*

21. Upper labials, 5 or 6..... 22
Upper labials 7. Rainbow snake.
Abastor erythrogrammus (Daudin).
(Coastal regions from southeastern Virginia to northern Florida and Alabama.)

22. Upper labials, 6; 2 postoculars, occasionally 1 or 3 (Fig. 22).....Virginia 23
Upper labials, 5; a single postocular (Fig. 16).
Potamophis striatulus (Linné). 18

23. Scales in 15 rows; few or none keeled.
Virginia valeriae valeriae (Baird & Girard).
(New Jersey to South Carolina, west to the Tennessee River and north to southern Ohio.)
Scales in 17 rows; usually keeled, at least posteriorly.
V. valeriae elegans (Kennicott).
(Southern Indiana, and eastern Illinois, south to the Gulf, and west to central Texas.)

24. Scale rows more than 17..... 27
Scale rows, 17..... 25

25. Tail long, caudals more than 100, ventrals about 150–170..... 26
Tail moderate, caudals less than 50; ventrals about 110–135.....*Seminatrix pygaea* (Cope).
(Beaufort, North Carolina, south throughout Florida.)

26. Color above, grass-green; upper labials, 7; lower labials, 8 or 7. Rough green snake.
Opheodrys aestivus (Linné).
(New Jersey, south on the Atlantic coastal plain throughout Florida; in the Mississippi Valley, north to southern Ohio, central Indiana, central Missouri, and southeastern Kansas; west to northeastern New Mexico, and south throughout Texas.)
Color above dark with a light spot on each scale; upper labials, 9; lower labials, 10 or 11.
Drymobius margaritiferus (Schlegel).
(Southern Texas to Venezuela and Colombia.)

27. Dorsal scales strongly keeled; 3 postoculars, or, if only 2, then the scale rows are only 19 (occasionally 23). Water snakes.....Natrix. 28
Dorsal scales weakly keeled; 2 postoculars; scale rows 25–33.....Elaphe. 44

28. Scale rows more than 19..... 29
Scale rows, 19..... 40

29. Scale rows, 21–25; lower labials usually 10..... 30
Scale rows usually 27–33 (rarely 25); lower labials usually 11–13..... 36

30. Scale rows, 23-25; no median row of light spots on belly..... 31
Scale rows, 21, if 23 rows of scales, then a median row of light spots on belly, at least anteriorly..... 38

31. No light line obliquely backwards from eye; ventrals, 135–155..... 32
A light line from eye obliquely to angle of mouth; ventrals, 123–135..... 34

32. A pattern of dorsal and lateral blotches more or less evident..... 33
Uniform dark above, and uniform light or reddish below, with dusky mottlings on posterior ventrals in

old individuals and dark bases to ventrals in young specimens; ventrals, 145–155. Copperbelly.
Natrix sipedon erythrogaster (Forster).[1]
(Lowlands of Virginia and the Carolinas, west to Louisiana and north in the Mississippi Valley into southern Illinois.)

33. Belly usually with numerous black-edged half circles; lateral spots not alternating with dorsal spots as far forward as the head; scales usually in 23 rows. Water Snake.....*N. sipedon sipedon* (Linné).[2]
(Northern Alabama to southern Maine, west to Minnesota and Colorado, south to Oklahoma and Arkansas.)

Belly immaculate or with dusky mottling chiefly on anterio-lateral ends of ventrals; lateral spots alternating with dorsal spots as far forward as the head; scales usually in 25 rows.
N. sipedon transversa (Hallowell).[3]
(Oklahoma and Arkansas, south into Mexico, and west into New Mexico.)

34. Dorsal saddles on body about 20 to 33..... 35
Dorsal saddles on body about 11 to 17.
N. fasciata confluens Blanchard.
(Eastern Louisiana north to southeastern Missouri, eastern and southern Arkansas, and west in Texas to about the 98th meridian.)

35. Dorsal saddles on body commonly about 24; ventral plates usually more than 128; belly often with dark quadrate spots; often small lateral spots alternating with the dorsal saddles.....*N. fasciata fasciata* (Linné).

[1] The variations, distribution and systematic relations of this and the next two forms are much in need of study. The young of *N. sipedon erythrogaster* have about the same pattern as *N. sipedon transversa.*
[2] See note 1.
[3] See note 1.

(Northern Florida and coastal regions from North Carolina to southeastern Louisiana.)

Dorsal saddles on body commonly about 29; ventrals usually less than 128; belly with dark, sometimes reddish, anterior borders on the ventral scales; often reddish markings with black edges particularly on ends of ventrals; no small lateral alternating spots.....*N. fasciata pictiventris* Cope. (Peninsular Florida.)

36. A single anterior temporal; dorsal spots, if visible, more than 26, connected with lateral spots..... 37

Two anterior temporals; 21 to 26 isolated quadrate spots on back to vent. Water pilot.
N. taxispilota (Holbrook).
(North Carolina to central Florida and possibly west to Louisiana.)

37. Eye in contact with upper labials; dorsal spots, 26–33; a single series of conspicuous lateral spots extending from ventrals to eighth or ninth row of scales, alternating and connected with dorsal spots; scale rows usually 27, less often 25, 29, or 31.
N. rhombifera (Hallowell).
(Illinois and Indiana to Alabama and through Texas to Vera Cruz, Mexico.)

Eye separated from upper labials by one or more subocular plates; dorsal spots about 50; two series of small, often ill-defined, lateral spots in alternation, the lower series extending from the ventrals to about the fifth to seventh row of scales; dorsal spots small and indistinct; scale rows usually 29–31, less often 27.....*N. cyclopion* (Dumeril & Bibron). (Extreme southern Illinois south through Louisiana and southeast throughout Florida.)

38. A median row of light spots on belly, at least anteriorly..... 39

No median row of light spots on belly.
N. valida (Kennicott).
(Southern Lower California and western Mexico.)

39. Dorsal surface spotted or unicolor.
N. compressicauda (Kennicott).
(Coastal regions of peninsular Florida [particularly west side] and adjacent coast of Cuba.)
A median dorsal and two lateral light stripes.
N. clarkii (Baird & Girard).
(Coastal regions of Texas, Louisiana and Alabama.)

40. Upper labials, 5–7 41
Upper labials, 8 ..... *N. valida* (Kennicott).
(Southern Lower California and western Mexico.)

41. Lower labials, 9–11; preoculars usually 2 42
Lower labials, 7; preoculars, 1. Kirtland's water snake ..... *N. kirtlandii* (Kennicott).
(Central and northeastern Illinois and southern Michigan to western Pennsylvania, and south throughout Ohio and Indiana.)

42. Two long dark stripes on middle of belly, at least anteriorly 43
One long median dark stripe on belly, or no markings (except on lateral ends of ventrals).
N. grahamii (Baird & Girard).
(Illinois and eastern Kansas to Louisiana and Texas.)

43. Ventro-lateral light stripes present. Striped water snake ..... *N. septemvittata* (Say).
(Pennsylvania to Wisconsin, south to central Alabama.)
No ventro-lateral light stripes ..... *N. rigida* (Say).
(South Carolina to western Louisiana and south into northern Florida.)

44. No small scales (suboculars) between eye and upper labials (Fig. 23) 46

A row of small scales (suboculars) between eye and upper labials (Fig. 24) 45

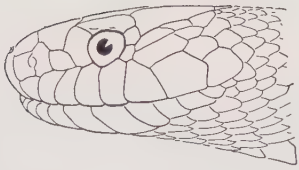

FIG. 23. *Elaphe vulpina*

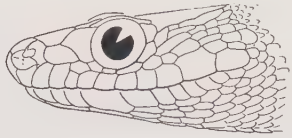

FIG. 24. *Elaphe subocularis*

45. Dorsal pattern of H-shaped blotches (Fig. 24).
Elaphe subocularis (Brown).
(Davis Mountains, Texas.)
Uniform olive-brown above, no blotches.
E. rosaliae (Mocquard).
(Central to southern Lower California.)

46. Dark brown or black or with blotches or stripes above, usually with dark markings below 47
Uniform grayish or greenish above, uniform whitish below ..... *E. chlorosoma* (Günther).
(Guerrero and Jalisco, Mexico, northward to the Santa Rita Mountains in Arizona.)

47. Pattern not of 50 or more narrow dark cross-bands separated by wide interspaces 48
Pattern of about 50 or more narrow dark cross-bands separated by wide interspaces ..... *E. bairdi* (Yarrow).
(Fort Davis, Texas.)

48. Neck bands of same color as dorsal blotches, traversing parietals and uniting on frontal plate; only the median dorsal scales, if any, keeled (Fig. 25) 49
No neck bands traversing parietals and uniting on frontal; 3–11 rows of smooth scales on each side (Fig. 26) 51

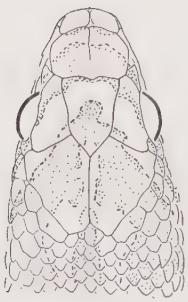

FIG. 25. *Elaphe laeta*

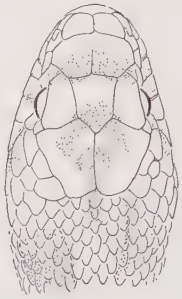

FIG. 26. *Elaphe vulpina*

49. Ventrals, 222–241; dorsal blotches, 27–40, reddish.... 50
Ventrals, 211–222; dorsal blotches, 39–48, grayish or light brown (Fig. 25).....*E. laeta* (Baird & Girard). (Kansas south to Central Mexico.)

50. Belly yellowish, checked prominently with black. *E. guttata* (Linné). (Virginia through Florida, west to the Mississippi and Louisiana.)
Belly pinkish, with little or no black.....*E. rosacea* (Cope). (Florida Keys.)

51. Ventrals, 226–244; dorsal blotches if present generally concave at anterior and posterior ends..... 52
Ventrals, 194–211; 31–38 dorsal blotches with anterior and posterior margins generally straight or slightly convex. Fox snake (Figs. 21, 26). *E. vulpina* (Baird & Girard). (Indiana, Illinois, Iowa and Minnesota to Michigan and Ontario.)

52. Caudals, male, 73–87; female, 63–77; pattern not of longitudinal stripes; postocular dark line, when present, thick and not interrupted..... 53
Caudals, male, 89–97; female, 69–95; pattern of 4 longitudinal stripes in adult; young with blotches; postocular dark line, when present, narrow and

interrupted.....*E. quadrivittata* (Holbrook).
(Southeastern North Carolina, south throughout Florida.)

53. Nearly or quite uniform black above; scale rows 25 or 27. (Young specimens like *E. obsoleta confinis*.)
Pilot black snake.....*E. obsoleta obsoleta* (Say).
(Wisconsin to Massachusetts and south through the Alleghanies.)
A pattern of about 30–35 dark quadrate blotches readily distinguishable; scale rows 27 or 29.
E. obsoleta confinis (Baird & Girard).
(North Carolina through the Gulf states into Texas, and north into Indiana.)

54. Scale rows fewer than 29..... 65
Scale rows, 29–35.....Pituophis 55

55. Rostral penetrating between internasals, conspicuously higher than wide (Fig. 27)..... 56
Rostral not or but slightly penetrating between internasals, about as high as wide (Fig. 28)..... 59

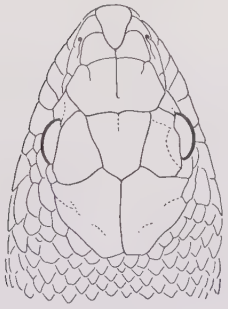

Fig. 27.
Pituophis sayi

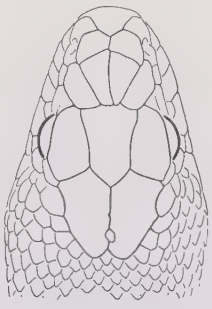

Fig. 28
Pituophis catenifer deserticola

56. A pattern of dorsal spots..... 57
No dorsal spots evident..... 58

57. Dorsal spots on body 25–35. Pine Snake.
P. melanoleucus (Daudin).

(New Jersey to eastern Tennessee and South Carolina.)

Dorsal spots on body 40–60. Bull snake.
P. sayi (Schlegel).
(Minnesota to Texas.)

58. A pied pattern of rusty brown.....*P. mugitus* Barbour (Florida.)
Uniform black above and below.....*P. lodingi* Blanchard. (Mobile County, Alabama.)

59. Coloration on anterior half of body not largely red... 60
Coloration on anterior half of body largely red; ventrals, 233 to 257; scales usually in 35 or 33 rows; dorsal blotches, 38–48; upper labials usually 9 or more.....*P. vertebralis* (Blainville). (Southern Lower California.)

60. Number of ventrals less number of dorsal blotches on body and tail rarely exceeds 151..... 61
Number of ventrals less number of dorsal blotches on body and tail usually more than 151; ventrals more than 220..... 63

61. Ventrals usually fewer than 225 (200–230); caudals, 51–80, average in males, 70, in females, 63; scale rows usually not more than 31..... 62
Ventrals usually more than 225 (217–243); caudals, 62–85, average in males, 76, in females, 70; scale rows usually more than 31.
P. catenifer annectens (Baird & Girard).
(Coastal region of southern California and northern Lower California.)

62. Dorsal blotches on body 56–93, average, 70; on tail 14–30, average, 21.....*P. catenifer catenifer* (Blainville). (Coast strip from Puget Sound to Santa Barbara County, California.)
Dorsal blotches on body, 48–70, average, 58; on tail

13–19, average, 15.....*P. catenifer heermanni* (Hallowell). (Klamath region, Oregon, through the Great Valley of California.)

63. Sum of numbers of scale rows and of preoculars on both sides of head rarely more than 33; usually one preocular.....*P. catenifer stejnegeri* Van Denburgh. (Utah.)
Sum of number of scale rows and of preoculars on both sides of head usually more than 33..... 64

64. Sum of caudal blotches and preoculars on both sides of head usually more than 16; usually 2 preoculars; posterior dorsal blotches not distinctly reddish. *P. catenifer deserticola* Stejneger. (Deserts of southern California, Nevada, Idaho and eastern Washington.)
Sum of caudal blotches and preoculars on both sides of head rarely more than 16; usually one preocular; posterior dorsal blotches often distinctly reddish or red-brown.....*P. catenifer rutilus* Van Denburgh. (Southern Arizona.)

65. Eye in contact with upper labials; rostral normal.... 66
Eye separated from upper labials by small scales; rostral much enlarged, separating internasals and in contact with prefrontals.....Phyllorhynchus. 122

66. Lower labials, 8 or more. Garter snakes. Thamnophis. 68
Lower labials, 5–7..... 67

67. A double row of black spots along middle of belly; preocular distinct from loreal; scale rows, 17–19–17. *Tropidoclonion lineatum* (Hallowell). (Southern Ohio to Iowa and western Kansas and south to the Gulf of Mexico.)
Belly light, unspotted; no preocular, loreal in contact with eye; scale rows, 17–17 or 17–15 (Fig. 16). *Potamophis striatulus* (Baird & Girard).

(Virginia to Missouri, south to Mobile and eastern Texas.)

68. Lateral stripe anteriorly upon third and fourth rows.. 69
Lateral stripe anteriorly not involving fourth row of scales, or absent..... 74

69. Tail generally more than 0.27 of total length. Ribbon snakes..... 70
Tail generally less than 0.27 of total length..... 72

70. Upper labials usually 7.
Thamnophis sauritus sauritus (Linné).
(United States east of the 87th parallel, and north of Florida.)
Upper labials usually 8..... 71

71. Tail between 0.25 and 0.35 of total length; dorsal stripe present throughout.....*T. sauritus proximus* (Say).
(Wisconsin to western Nebraska, south through Texas and Louisiana, and along the coastal regions to Nicaragua.)
Tail between 0.32 and 0.38 of total length; dorsal stripe usually absent, or present only directly behind the head.....*T. sauritus sackenii* (Kennicott).
(Florida and coastal regions of adjacent states.)

72. Dorsal scale rows usually a lower formula than 21–19–17; upper labials usually less than 8..... 73
Dorsal scale rows usually 21–19–17; upper labials, 8, occasionally 9.....*T. megalops* (Kennicott).
(Plateau of Mexico north to southwestern New Mexico, southern Arizona, and the Cocopah Mountains in Lower California.)

73. Dorsal scale rows usually 19–21–19–17; upper labials, 7 or 8.....*T. radix radix* (Baird & Girard).
(Great Plains and prairie regions of central North America.)
Dorsal scale rows usually 19–17; upper labials, 6 or 7.
T. radix butleri (Cope).

(Indiana, Ohio, southern Michigan, western Pennsylvania.)

74. Lateral stripe anteriorly upon scales of second and third rows, or absent..... 75
Lateral stripe on the third row only.
T. marcianus (Baird & Girard).
(Oklahoma and Texas to southeastern California and northern Mexico.)

75. Upper labials normally 7..... 76
Upper labials normally 8..... 80

76. Eye large; posterior chin-shields much longer than anterior; lower labials usually 10; scale rows, 19–17. 77
Eye much smaller; posterior chin-shields about equal to anterior; lower labials usually fewer than 10; scale rows usually 17–15.
T. ordinoides ordinoides (Baird & Girard).
(Coastal regions from British Columbia to northern California.)

77. Both rows of lateral spots distinct on the skin; interspaces not generally red.....*T. sirtalis sirtalis* (Linné).
(North America east of the 91st meridian and south of the 52d parallel.)
Upper row of lateral spots usually fused on the skin; interspaces generally red..... 78

78. Ventrals (146–170) and caudals (66–95) average respectively 156–166 and 76–85..... 79
Ventrals (156–177) and caudals (74–97) average respectively 163–169 and 83–90; coloration lighter than in *T. sirtalis concinnus.*
T. sirtalis infernalis (Blainville).
(Southern Oregon, western Nevada and California except the northwestern part.)

79. Coloration lighter, with broader light lines. Red-sided garter snake.....*T. sirtalis parietalis* (Say).

(Central Alberta and Minnesota, south through northern Missouri, and west through Nevada and eastern Washington.)

Coloration usually darker both above and below, lines often narrower..... *T. sirtalis concinnus* (Hallowell). (Coast region from British Columbia to San Francisco Bay.)

80. Scales usually in more than 19 rows..... 82
Scales usually in not more than 19 rows..... 81

81. Ventrals average more than 160; eye large; posterior chin-shields longer than anterior..... *T. eques* (Reuss). (Arizona to western Texas and south to Guatemala.)
Ventrals average fewer than 160; eye small; posterior chin-shields about equal to anterior.
T. ordinoides atratus (Kennicott). (Coastal region of California south to Santa Barbara County.)

82. Dorsal stripe present over most of body..... 83
Dorsal stripe usually absent, or short, or indistinct.... 85

83. Dorsal stripe with borders invaded by dorsal spots; dark pigmentation of ventrals often present..... 84
Dorsal stripe very distinct with sharply defined borders not invaded by dorsal spots; little dark pigmentation on ventrals... *T. ordinoides elegans* (Baird & Girard). (Sierra Nevada and San Bernardino Mountains.)

84. Ventrals usually 160–180.
T. ordinoides vagrans (Baird & Girard). (Idaho and eastern Washington south to eastern California and northern Arizona.)
Ventrals, 151–161..... *T. hueyi* Van Denburgh & Slevin. (San Pedro Martir Mountains, Lower California.)

85. No dorsal stripe, often more than one preocular, lower labials rarely more than 10..... 86

Remnant of dorsal stripe usually present, preocular single; lower labials more than 10.
T. ordinoides couchii (Kennicott).
(Sacramento and San Joaquin valleys of California from Shasta to Kern counties and on the eastern side of the Sierra Nevada into western Nevada.)

86. Lateral stripes usually present, dorsal spots fewer, or absent. . . . . *T. ordinoides hammondii* (Kennicott).
(Southern California west of the deserts, and south to central Lower California.)
Lateral stripes usually absent, dorsal spots very numerous and prominent. . . . *T. angustirostris* (Kennicott).
(Southern Arizona and southwestern New Mexico south to Coahuila and Durango.)

87. Anal plate divided (Fig. 29). 123
Anal plate not divided (Fig. 30). 88

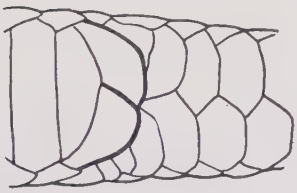

Fig. 29. Divided anal plate

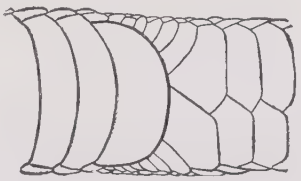

Fig. 30. Undivided anal plate

88. Scale rows not the same in number at the posterior end of the body as at the middle. 89
Scale rows the same in number at the posterior end of the body as at the middle. 118
89. None (or rarely a very few) of the caudals entire. 90
Many (20–40) of the caudals entire.
Rhinocheilus lecontei (Baird & Girard).
(From western Kansas and the 97th meridian in Texas, northwest to southern Idaho and northern California, and south through Lower California.)

90. Belly never entirely without dark markings; rostral normal; lower labials, 7 to 10, only rarely 11 or 12. King snakes.....Lampropeltis. 92

Belly light and immaculate; rostral penetrating prominently between internasals; lower labials, 12–15, commonly 13 or 14.....Arizona. 91

91. Scale rows usually 29 or 31; dorsal blotches on body about 55 (40 to 57), large and squarish, covering about 12 or 13 lateral rows of scales and 2 to 3 longitudinal rows, and separated by 1 to $1\frac{1}{2}$ scales; lateral spots conspicuous and roundish; tail 0.138 to 0.157 of total length....*A. elegans elegans* (Kennicott). (From about the 98th meridian in Texas, west through northeastern Mexico and New Mexico into southeastern Arizona.)

Scale rows, 27, only occasionally 29; dorsal blotches on body about 60 (54 to 77), narrow, covering about 7 to 10 lateral rows and $1\frac{1}{2}$ to 2 longitudinal rows of scales, and separated by about 2 scale lengths; lateral spots narrow or indistinct; tail 0.100 to 0.148 of total length....*A. elegans occidentalis* Blanchard. (Southeastern Arizona west through southern California and northern Lower California.)

92. Pattern not of narrow cross-bands of black with the alternate bands mixed or split with red..... 93

Pattern of narrow cross-bands of black, the alternate bands mixed or split with red; ground color above slate-gray.....*Lampropeltis alterna* (Brown). (Davis Mountains, Texas.)

93. Color pattern without red and without dorsal blotches of brown or gray with black borders.[4]..... 94

Pattern with red, or with dorsal blotches of brown, gray, or red, with black borders..... 105

[4] The red fades to whitish in preservative, but it is sufficient, for the purpose of the key, to determine that the pattern is in two colors instead of in three.

94. Pattern in rings, cross-bands, or stripes, or chiefly of scales white at base shading gradually into a black distal border, but not chiefly of sharply defined white or yellow spots on black scales..... 97
Scales chiefly black with sharply defined white or yellow spots (not light at base shading gradually into a dark distal border), these yellow spots often so grouped as to form 50 or more narrow cross-bands on body and tail..... 95

95. Scale rows on middle of body usually 21..... 96
Scale rows on middle of body 23 or 25; no light centers dorsally on the scales between the cross-bands; head mostly black.
L. getulus splendida (Baird & Girard).
(Southeastern Arizona to 97th meridian; southern Texas, and northern Mexico.)

96. A yellow spot on practically every dorsal scale. Speckled king snake.....*L. getulus holbrooki* (Stejneger).
(Eastern Texas to southeastern Wyoming, east to eastern Illinois, and south to the Gulf of Mexico.)
Scales between the cross-bands without light centers or with only a very few small ones.
L. getulus nigra (Yarrow).
(Eastern Illinois to Ohio, south to central Alabama.)

97. Pattern neither of rings nor of longitudinal stripes; posterior chin-shields nearly as long and nearly as wide as anterior, in contact or separated by not more than one small scale..... 98
Pattern of rings, or of longitudinal stripes of white or yellowish; posterior chin-shields generally much shorter and narrower than anterior and separated by 1 or 2 small scales..... 100

98. Many dorsal cross-bands of white or yellow..... 99
No dorsal cross-bands distinguishable; dorsal scales light at base, shading gradually into a dark distal

border.....*L. getulus brooksi* Barbour.
(Extreme southern Florida.)

99. Cross-bands fewer than 50; 21 (sometimes 23) rows of scales. Chain snake; king snake.
L. getulus getulus (Linné).
(New Jersey to Mobile Bay and central Florida.)
Cross-bands more than 50, or nearly indistinguishable; 23 (sometimes 21) rows of scales; scales between the cross-bands usually white at base.
L. getulus floridana Blanchard.
(Central and southern Florida.)

100. Pattern of rings..... 101
A dorsal longitudinal stripe, complete or interrupted.. 103

101. White scales mostly brown at their bases; white bars on prefrontals broad or narrow; lower labials, 9 or 10. 102
White scales white to their bases, forming rings of uniform white; white bars on prefrontals broad, convex behind; lower labials usually 9.
L. getulus boylii (Baird & Girard).
(California, Nevada, southwestern Utah, northern and western Arizona, and northern Lower California.)

102. White bars on prefrontals occupying less than half the area of these plates; frontal plate uniform black, or with the white restricted to a narrow transverse bar at its anterior end; no white on parietals; lower labials usually 9.....*L. getulus yumensis* Blanchard.
(Southern Arizona, extreme southeastern California, northeastern Lower California and northwestern Sonora.)
White bars on prefrontals occupying more than half the area of these plates; frontal plate with prominent white markings; or at least with a central spot of white; each parietal with one or more white

spots; lower labials usually 10. *L. getulus conjuncta* (Cope). (Southern Lower California.)

103. Dorsal stripe white or yellow, sharply defined on a dark brown or black ground color. *L. californiae californiae* (Blainville). (Fresno County, California, to northern Lower California.)

Dorsal stripe brownish 104

104. Dorsal stripe narrow, about 3 scales wide, of light brown or cinnamon on a dark brown ground color. *L. californiae nitida* (Van Denburgh). (Southern Lower California.)

Dorsal stripe broad, about 5 scales wide, of dark purplish brown; lateral scales yellowish white with narrow purplish brown borders. *L. catalinensis* Van Denburgh. (Santa Catalina Island, Gulf of California.)

105. Pattern of black-edged dorsal blotches of brownish or dark red, only narrowly in contact with fifth row of scales, or extending no lower than the sixth or seventh rows 106

Pattern in rings; or, if in blotches or saddles of brown, gray, or red, these broadly in contact with the fifth or a lower row of scales 107

106. Scale rows, 25–27; dorsal blotches with concave anterior and posterior margins; lower labials, 9 or 10, rarely 8 ..... *L. calligaster* (Say). (Western Texas to Mississippi, north to Indiana and northwest to Minnesota, thence south to Texas.)

Scale rows, 23 or 21 on middle of body; dorsal blotches with straight or convex anterior and posterior margins; lower labials, 8, less often, 9. Brown king snake ..... *L. rhombomaculata* (Holbrook). (Mobile to Knoxville, Tennessee, north to Maryland, and south to central Florida.)

107. Whitish cross-bands on body and tail fewer than 40; or if more than 40, snout not uniformly whitish.... 108
Whitish cross-bands on body and tail more than 40; top of head black, snout uniformly white.
L. pyromelana (Cope).
(Utah, Arizona, western New Mexico and northern Mexico.)

108. Whitish cross-bands usually distinctly widened on first row of scales, or scale rows anteriorly not more than 17 112
Whitish cross-bands little, if any, widened on the lower rows of dorsal scales, and scale rows more than 17 on anterior end of body..... 109

109. Whitish annuli usually more than 30; snout black. Coral king snake.....*L. multicincta* (Yarrow).
(California.)
Whitish annuli fewer than 30..... 110

110. Dorsal red areas usually continuous across the belly; snout whitish, specked with black.
L. triangulum amaura (Cope).
(Lower Mississippi Valley.)
Spaces on belly between the yellow rings filled with black; snout totally black, or only very slightly lightened on top or sides..... 111

111. Yellowish rings, 19–25; black spaces on belly usually longer than the intervening yellow ones.
L. triangulum annulata (Kennicott).
(Plateau region of southern Mexico north to extreme southern Texas.)
Yellowish rings, 25–40; black spaces on belly usually shorter than the intervening yellow ones.
L. triangulum gentilis (Baird & Girard).
(South central Texas, to South Dakota, west into Utah and Arizona.)

112. Black of head practically restricted to posterior portion, or to various black-edged light markings..... 114
Black practically uniform over head, except for snout region, which is more or less lightened, at least on the sides; scale rows anteriorly more than 17..... 113

113. Whitish annuli or cross-bands, 25–40; black often strongly encroaching upon the red on the mid-dorsal line.....*L. triangulum gentilis* (Baird & Girard). (South central Texas to South Dakota, west into Utah and Arizona.)
Whitish annuli or cross-bands, 18–25; black showing not more than a slight tendency to encroach upon the red areas on the mid-dorsal line.
L. triangulum amaura (Cope).
(Lower Mississippi Valley.)

114. Usually two anterior temporals; scale formula very rarely lower than 19–21–19–17 (Fig. 31)..... 116
Usually single anterior temporal; scale formula generally 17–19–17, rarely higher than 19–17 (Fig. 32). 115

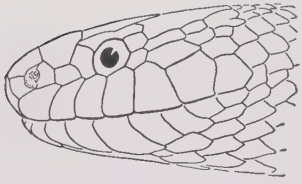

Fig. 31.
Lampropeltis triangulum triangulum

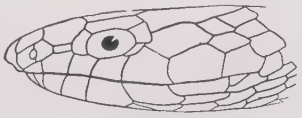

Fig. 32.
Lampropeltis elapsoides elapsoides

115. Red areas continuous across the belly. Scarlet king snake.....*L. elapsoides elapsoides* (Holbrook). (North Carolina and Kentucky, south to New Orleans and throughout Florida.)
Red not continuous across the belly, but restricted to black-bordered dorsal saddles that extend upon the ventrals.....*L. elapsoides virginiana* Blanchard. (Northern North Carolina to Delaware.)

116. Whitish cross-bands, 23–60; pattern of dorsal saddles or blotches of red or brown..... 117
Whitish annuli or cross-bands, 18–30; pattern of body practically in rings.....*L. triangulum amaura* (Cope).
(Lower Mississippi Valley.)

117. Dorsal saddles, 35–60, reaching down to the fifth or third row of scales; often two rows of lateral alternating blotches; a dark band on posterior portion of prefrontals; a black-bordered light band from the eye to angle of mouth; usually a Y-shaped light spot on back of head. Spotted adder; milk snake.
L. triangulum triangulum (Lacépède).
(Eastern United States and southern Canada.)
Dorsal saddles 23–35, extending down to the third row of scales, or lower; only one series of alternating spots; head markings of *triangulum* only partially or not at all developed.....*L. triangulum syspila* (Cope).
(Southern Indiana to Minnesota, south to central Arkansas and west to central Kansas.)

118. Scale rows, 17.....Drymarchon. 119
Scale rows, 19..... 120

119. Nearly entirely black; sixth upper labial (or the one behind eye) not in contact with lower anterior temporal, the two adjacent labials meeting in a suture above it. Indigo snake (Fig. 33).
D. corais couperi (Holbrook).
(Southeastern Georgia and Florida to southwestern Alabama.)
Color generally brown to light brown anteriorly, lighter on belly, posterior part of body with tail, black; upper labial behind eye (usually sixth) generally in contact with lower anterior temporal, or with a small scale cut off from it (Fig. 34).
D. corais melanurus (Dumeril & Bibron).
(Southern Texas into Central America.)

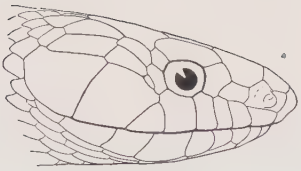

FIG. 33.
Drymarchon corais couperi

FIG. 34.
Drymarchon corais melanurus

120. Loreals, 1–4; parietal separated from upper labial by anterior temporal (Fig. 35)..... 121
No loreal; parietal in contact with upper labial (Fig. 36).....*Stylophis extenuatus* (Brown). (Central to northern Florida.)

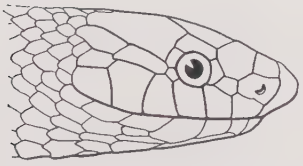

FIG. 35. *Cemophora coccinea*

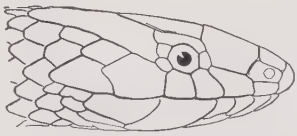

FIG. 36. *Stylophis extenuatus*

121. One or two preoculars; eye in contact with upper labials (Fig. 35).....*Cemophora coccinea* (Blumenbach). (Maryland to Louisiana, north to southern Tennessee, and south through Florida.)
Three preoculars; eye separated from upper labials by small scales.....Phyllorhynchus. 122

122. About 11 to 13 dorsal spots on body, and no lateral spots.....*P. browni* Stejneger. (Southern Arizona.)
About 25 to 45 dorsal spots on body, and one or two rows of lateral spots.....*P. decurtatus* (Cope). (Southwestern Arizona, southern California and Lower California.)

123. Scale rows fewer than 19..... 124
Scale rows, 19 or more..... 179

124. Loreal present (Figs. 37, 38)..... 125

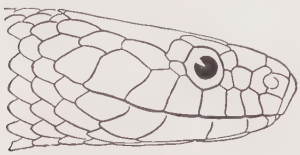

Fig. 37.
Diadophis punctatus edwardsii

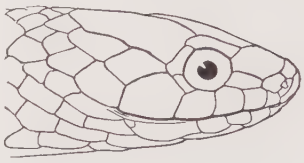

Fig. 38.
Virginia valeriae valeriae

No loreal (Fig. 39)..... 169

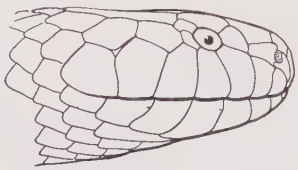

Fig. 39. *Micrurus fulvius*

125. One or more preoculars present (Fig. 37)..... 129
No preocular; loreal and prefrontal in contact with eye (Fig. 38)..... 126

126. Scale rows, 13; upper labials, 5; nasal plate entire. Worm snake.....Carphophis. 127
Scale rows more than 13; upper labials six; nasal divided.....Virginia. 23

127. Color above generally brown; light color of belly extending onto first or second row of dorsal scales; commonly 2 temporal plates behind the first..... 128
Color above generally gray or black; light color of belly extending usually onto the third row of dorsal scales; commonly only a single temporal behind the first.....*Carphophis amoena vermis* (Kennicott). (Southeastern Nebraska and central Missouri south through eastern Oklahoma, Arkansas and Louisiana.)

128. Internasals and prefrontals usually separate (Fig. 40). *C. amoena amoena* (Say).

(Connecticut, and Albany County, New York, south to central Florida, and west into the Appalachian Mountains.)

Internasals and prefrontals usually united into two large shields (Fig. 41) ....*C. amoena helenae* (Kennicott). (From Central Illinois south through Mississippi and east to northwestern Alabama, the Tennessee Valley in eastern Tennessee, and eastern Ohio.)

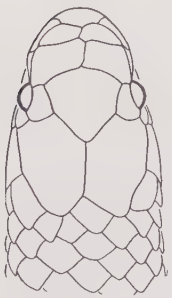

Fig. 40.
Carphophis amoena amoena

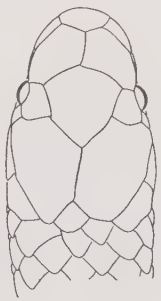

Fig. 41.
Carphophis amoena helenae

129. Two or three preoculars (Fig. 42)..... 130
A single preocular (Fig. 43)..... 162

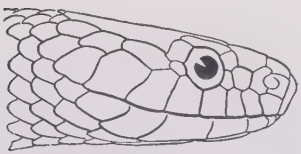

Fig. 42. *Diadophis punctatus edwardsii*

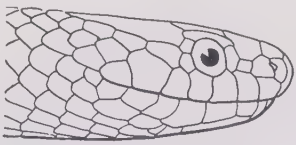

Fig. 43. *Contia tenuis*

130. Rostral normal (Fig. 44)..... 132
Rostral widened laterally with projecting edges, and curved backwards over snout (Fig. 45). Patch-nosed snakes.....Salvadora. 131

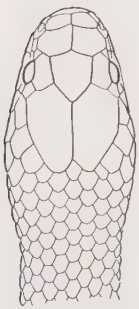

FIG. 44.
Diadophis punctatus edwardsii

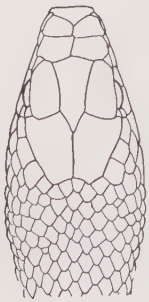

FIG. 45.
Salvadora grahamiae grahamiae

131. Posterior pair of chin-shields in contact or separated by one small scale; upper labials usually 8; lower labials usually 9; first pair of lower labials meeting in a suture of normal length (Fig. 46).

S. grahamiae grahamiae (Baird & Girard).

(Southern and western Texas and eastern New Mexico, south to the Isthmus of Tehuantepec.)

Posterior pair of chin-shields separated by 2 small scales; upper labials, 9 or 10; lower labials, 10 or 11; first pair of lower labials elongated posteriorly, forming an unusually long suture.

S. grahamiae hexalepis (Cope).

(Western New Mexico, Utah, Arizona, Nevada, southern California, Lower California and northwestern Mexico.)

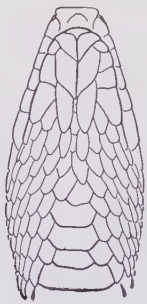

FIG. 46. *Salvadora grahamiae grahamiae*

132. Usually 2 or 3 anterior temporals; lower preocular very small, wedged between the adjacent upper labials. Racers and whip snakes (Fig. 47)..... 145
A single anterior temporal; lower preocular moderate in size, not wedged between the adjacent upper labials (Fig. 48)..... 133

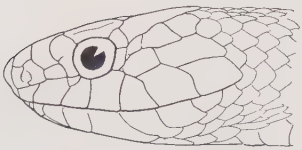

FIG. 47
Coluber constrictor flaviventris

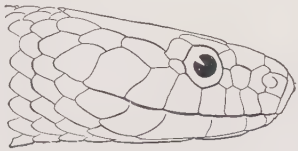

FIG. 48.
Diadophis punctatus edwardsii

133. Usually a neck ring and often black spots on ventral scales; color above not grass-green; nasal plate divided. Ringneck snakes.....Diadophis. 134
No neck ring and no black spots on ventral scales; color above, grass-green; nasal plate not divided. Smooth green snake; grass snake.
Liopeltis vernalis (Harlan).
(North Dakota to Nova Scotia, south through Pennsylvania, Ohio and Indiana, thence west into Utah, and south through New Mexico, the Texas Panhandle, and Oklahoma.)

134. Ventral color extending, on anterior portion of body, onto one or more of lowermost rows of dorsal scales; ventral plates usually more than 180..... 138
Ventral color not extending onto lowermost row of dorsal scales; ventral plates usually fewer than 180..... 135

135. Black spots on belly in a single median row, or nearly or quite absent (very rarely irregular); upper labials usually 8 137
Black spots on belly numerous, and scattered or irregular; upper labials, 7 (only rarely 8)..... 136

136. Ventrals in males more than 145, in females, more than 150; scale rows, 17–17, or 17–15 (occasionally only 15); belly spots scattered or in two's, generally clean-cut in appearance.
Diadophis punctatus arnyi (Kennicott).
(Western Illinois, Iowa, Missouri, northwestern Arkansas, west to the Great Plains and south into Texas.)

Ventrals in males fewer than 145, in females, fewer than 150; scale rows 15 throughout; belly spots showing tendency to fuse into a single row, or irregularly massed ..... *D. punctatus strictogenys* Cope.
(Southern Illinois through the lower part of the Mississippi Valley to the Gulf.)

137. Sum of ventrals and caudals usually less than 191; belly with a series of large half-circular black spots along the median line; neck ring usually partially or wholly interrupted on the mid-dorsal line.
D. punctatus punctatus (Linné).
(Eastern Alabama, north to southern Virginia, and south throughout Florida.)

Sum of ventrals and caudals usually more than 191; belly usually immaculate, but sometimes with a median series of small black spots, more or less imperfectly developed; neck ring only rarely interrupted on the mid-dorsal line.
D. punctatus edwardsii (Merrem).
(Wisconsin to the southern Appalachians and north into Canada.)

138. Ventrals in males fewer than 206; in females, fewer than 220 140

Ventrals in males more than 206; in females, more than 220 139

139. Neck ring present, 2 to 4 scales in width.
D. regalis arizonae Blanchard.

(Central Arizona, south into Sonora.)

Neck ring absent, or much reduced.
D. regalis regalis (Baird & Girard).
(Central Texas to southeastern Arizona.)

140. Scale rows, 17–15 (rarely 15–15).....141
Scale rows, 15–15 or 15–13 (rarely 17–15 or 15–17–15)..142

141. Ventral color not covering more than three-fourths of the lowermost row of dorsal scales; belly usually conspicuously spotted with black.
D. amabilis modestus (Dumeril and Bocourt).
(San Bernardino Mountains, Los Angeles County, and Santa Catalina Island, California.)

Ventral color covering from $1\frac{1}{2}$ to 2 of the lowermost rows of dorsal scales; belly usually only lightly spotted with black...*D. amabilis vandenburgii* Blanchard.
(Ventura to Santa Cruz counties, California.)

142. Ventral color covering usually more than two-thirds of the first row of dorsal scales..... 143

Ventral color covering from one-third to two-thirds of the lowermost row of dorsal scales; neck ring only rarely interrupted; color above usually olive or bluish slate.....*D. amabilis similis* Blanchard.
(Southwestern San Bernardino County, California, south into the San Pedro Martir Mountains.)

143. Neck ring from 1 to $1\frac{1}{2}$ scales in width, often interrupted; ventral color covering from $\frac{1}{2}$ to $1\frac{1}{2}$ rows of dorsal scales; belly well sprinkled with small black spots; dorsal color usually dark.
D. amabilis amabilis (Baird & Girard).
(San Francisco Bay and the San Joaquin and Sacramento River valleys, California.)

Neck ring from $1\frac{1}{2}$ to 3 scales wide, not interrupted; ventral color covering from $1\frac{1}{2}$ to 2 or more rows of dorsal scales; belly never heavily spotted with black..... 144

144. Two lowermost rows of dorsal scales flecked with black; belly rather conspicuously, although sparsely, marked with small black dots.

D. amabilis occidentalis Blanchard.

(Sonoma County north through Humboldt County, California, to the Columbia River.)

Two lowermost rows of dorsal scales unicolor (not flecked with black); belly almost or quite unspotted.

D. amabilis pulchellus (Baird & Girard).

(Western slopes of the Sierra Nevada, south, perhaps to Tejon Pass in California, and north to southern Oregon.)

145. Scale rows 15 at posterior end of body (scale formula 17–15 or 15–15).....Coluber. 146

Scale rows 13 or 11 at posterior end of body (scale formula 17–13, 15–13, or 15–11).....Masticophis.[5] 148

146. Black or very dark gray above, dark gray below; caudals average 106. Black snake.

Coluber constrictor constrictor (Linné).

(Eastern United States west to central Indiana, thence southwest through southern Illinois and eastern parts of Missouri, Arkansas and Texas.)

Blue-gray, olive-brown or greenish above; below, light bluish, greenish, or yellow; caudals average 82 or 87. 147

147. Upper labials, 7; caudals average 82; color above blue-gray or blue. Blue racer.

C. constrictor flaviventris (Say).

(From Rocky Mountains east through Texas, western Arkansas, Missouri and Michigan, and northern parts of Illinois, Indiana and Ohio.)

Upper labials usually 8; caudals average 87; color above olive-brown, green, or blue-gray.

C. constrictor mormon (Baird & Girard).

(West of the Rocky Mountains.)

[5] The species here segregated under Masticophis are by most authors assigned to Coluber. See remarks on page ix.

148. Scales in 15 rows 149
Scales in 17 rows 152

149. Head plates with light edges 151
Head plates not light-edged — uniform olive-brown ... 150

150. Two to 4 dark and 2 light lateral stripes.
Masticophis schotti (Baird & Girard).
(Eagle Pass, Texas.)
A single light lateral stripe or none.
M. ruthveni Ortenburger.
(Vicinity of Brownsville, Texas, and northeastern Tamaulipas, Mexico.)

151. No light cross-band across neck. Western striped racer.
M. taeniatus taeniatus (Hallowell).
(Idaho and southern Oregon south to central Mexico, west to the Sierra Nevada, and east to Texas.)
One or several light cross-bands just behind head or on neck and body.
M. taeniatus girardi (Stejneger & Barbour).
(Western Texas.)

152. Pattern of one or more distinct longitudinal stripes, which may or may not be interrupted anteriorly ... 153
No distinct longitudinal stripes present; pattern, if any, of dark cross-bands 156

153. Dark lateral stripe on second and third scale rows interrupted at intervals of 5–7 scales by light areas.
M. aurigulus (Cope).
(Extreme southern Lower California.)
Dark lateral stripe not interrupted at intervals by light areas 154

154. Lateral light stripes uniform in width 155
Lateral light stripe enlarged at intervals of 4–7 scales.
M. barbouri (Van Denburgh).
(Espiritu Santo Island, Gulf of California.)

155. Two or three lateral light stripes anteriorly, not continued to tail. Sonoran Racer. . . *M. semilineatus* (Cope). (Southern Arizona, south through all the coast states of Mexico to Oaxaca.)

A single light line along scales of third and fourth lateral rows, continuing to tail. . . . *M. lateralis* (Hallowell). (California west of the Sierra Nevada and south into Lower California.)

156. Dorsal surface of body and tail not all black. 157

Entire dorsal surface of body and tail black. (Juvenile coloration not known.) Black whip snake.

M. piceus (Cope).

(California to eastern Arizona and Lower California.)

157. Black or dark-brown cross-bands present across neck or body. 160

No black cross-bands present. 158

158. No elongate blackish spots irregularly scattered on dorsal scales. 159

Elongate blackish spots on dorsal scales irregularly scattered; these spots not longer than a single scale.

M. anthonyi (Stejneger).

(Clarion Island, Gulf of California.)

159. Head and anterior portion of body a uniform very dark brown, gradually becoming much lighter posteriorly. (Adults.) Coach-whip snake.

M. flagellum flagellum (Shaw).

(Southeastern United States west to eastern Texas, Oklahoma and Kansas.)

Anterior portion of body not darker than the posterior. (Adults.) Whip snake.

M. flagellum flavigularis (Hallowell).

(Texas, except eastern fourth, western Oklahoma, western Kansas, Colorado, New Mexico, and south into the central plateau of Mexico.)

160. Through loreal plate a distinct white stripe bordered by black. Western whip snake.
M flagellum frenatus (Stejneger).
(Western New Mexico and Colorado, west to the coast, including Lower California.)
No distinct white stripe through loreal plate..... 161

161. Dark brown cross-bands on neck separated by 1–2 scales of lighter brown; most of last upper labial cream in color (juveniles). Coach-whip snake.
M. flagellum flagellum (Shaw).
(Southeastern United States west to eastern Texas, Oklahoma and Kansas.)
Dark brown cross-bands on neck separated by 3 or more scales of light brown; all but anterior lower corner of last upper labial brown. (Juveniles.) Whip snake.....*M. flagellum flavigularis* (Hallowell).
(Texas, except eastern fourth, western Oklahoma, western Kansas, Colorado, New Mexico, and south into the central plateau of Mexico.)

162. Scale rows less than 17..... 163
Scale rows, 17..... 168

163. Color not grass-green; posterior chin-shields much shorter than anterior chin-shields; caudals 30–60.. 164
Color grass-green; posterior chin-shields longer than, or about as long as, anterior chin-shields; caudals 70–100. Smooth green snake; grass snake.
Liopeltis vernalis (Harlan).
(North Dakota to Nova Scotia, south through Pennsylvania, Ohio and Indiana, thence west into Utah, and south through New Mexico, the Texas Panhandle, and Oklahoma.)

164. Belly uniformly light or crossed by numerous black bands that encircle the body; no light line on fourth or fifth row of scales; nasal plate usually entire (Fig. 49).....Sonora 165

Each ventral with a conspicuous black anterior border; light line generally evident on the fourth or fifth row of scales; tail generally with few or no black markings below; nasal plate usually divided below the nostril (Fig. 50).

Contia tenuis (Baird & Girard).

(Vancouver Island, south to the southern end of the Sierra Nevada.)

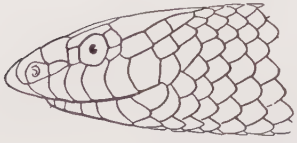

FIG. 49. *Sonora occipitalis*

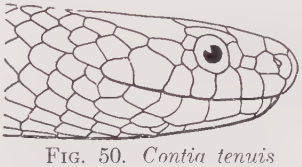

FIG. 50. *Contia tenuis*

165. Scale rows, 15; ventrals, 138–179..... 166
Scale rows, 13; ventrals, 126–137.

Sonora taylorii (Boulenger).

(Southern Texas and northeastern Mexico.)

166. Pattern of black rings, the posterior of which encircle the body; scale formula, 15–15.

S. occipitalis (Hallowell).

(Boulder, Colorado, southern Utah, western Arizona, and deserts of southeastern California.)

Black rings, if present, not encircling the body; scale formula more commonly 15–14 167

167. Pattern of 17 to 40 black cross-bands on body.

S. semiannulata Baird & Girard.[6]

(From about the 97th meridian in Texas, Oklahoma, and Kansas, west through Arizona and into Nevada.)

General color brown above, without black cross-bands, sometimes with a pale mid-dorsal light line.

S. episcopa (Kennicott).[7]

[6] *S. semiannulata* and *S. episcopa* may be color-phases of the same species. See Ortenburger, *Copeia*, No. 120, p. 79.

[7] See note 6.

(Central Oklahoma and Texas, west into southeastern California, north to southern Idaho, and south throughout Lower California.)

168. Light brown above; a dark line from rostral through eye to middle of last upper labial; internasals truncate in front; upper labials, 7; caudals more than 60 ..... *Leimadophis flavilatus* (Cope).
(North Carolina to Florida and Mississippi.)

Dark brown or black above; no line from rostral to last upper labial; internasals nearly pointed in front; upper labials usually 8; caudals fewer than 60 ..... *Seminatrix pygaea* (Cope).
(North Carolina through Florida.)

169. Scale rows more than 13 172
Scale rows, 13 ..... Chilomeniscus. 170

170. Numerous black cross-bands or rings on body; rostral in contact with prefrontals, separating internasals; 13, rarely 12, rows of scales at posterior end of body (Fig. 51) 171

No black cross-bands; each dorsal scale except in the two lower rows, with a black point; rostral generally separated from prefrontals by internasals; 12 rows of scales at posterior end of body (Fig. 52). *C. stramineus* Cope.

(Southern Lower California.)

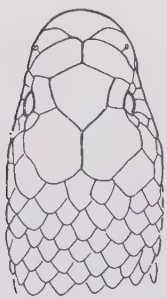

Fig. 51. *Chilomeniscus cinctus*

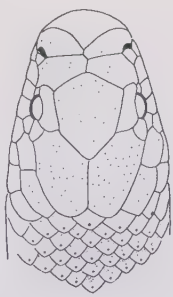

Fig. 52. *Chilomeniscus stramineus*

171. Cross-bands or rings about 17 to 23 on body, 3 to 5 on tail.....*C. cinctus* Cope.
(Southeastern California and Arizona, south through Lower California and northwestern Mexico.)
Cross-bands on body about 32, on tail about 7.
C. punctatissimus Van Denburgh & Slevin.
(Espiritu Santo and Magdalena islands, Lower California.)

172. Scale rows, 15; rostral normal..... 173
Scale rows, 17; rostral acute, elevated at tip, its upper surface concave, separating the small internasals and broadly in contact with the prefrontals; posterior teeth in upper jaw not enlarged and grooved; pattern of about 30 transverse blotches of brown.....*Ficimia cana* (Cope).
(Western Texas to Arizona.)

173. Coloration above uniform except near head; ventral plates fewer than 190; grooved fangs in posterior part of upper jaws..... Tantilla. 174
Coloration in rings of black, yellow, and red; ventral plates more than 200; grooved fangs in anterior part of upper jaw.....Elapidae. Micrurus. 185

174. On neck a light cross-band bordered behind with a dark band (Fig. 53)..... 175
On neck no light cross-band bordered behind with black (Fig. 54)..... 176

Fig. 53. *Tantilla coronata*

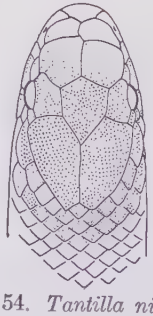

Fig. 54. *Tantilla nigriceps*

175. Light band involving tips of parietals; ventrals about 132–154; 2 postoculars (Fig. 53)..... 176
Light band separated from parietals by 3 or 4 dorsal scales; ventrals about 172–182; usually 1 postocular..... *Tantilla eiseni* Stejneger.
(From Fresno County, California, to northern Lower California.)

176. Posterior dark border of light band broad, i.e., 3 or 4 scales wide; ventrals about 130–143 (Fig. 53).
T. coronata (Baird & Girard).
(Southeastern states, west into Mississippi and north through central and western Tennessee.)
Posterior dark border of light band narrow, i.e., 1 to $1\frac{1}{2}$ scales wide; ventrals about 155 (Fig. 55).
T. wilcoxi Stejneger.
(Southeastern Arizona.)

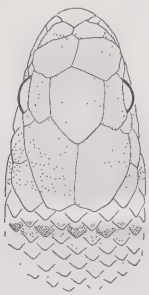

Fig. 55. *Tantilla wilcoxi*

177. Head black; upper labials, 7; 2 postoculars; ventrals 136–161 (Fig. 54)..... 178
Head brown, but little darker than body color; upper labials, 6; 1, rarely 2, postoculars; ventrals, 111–133..... *T. gracilis* Baird & Girard.
(Central Missouri and eastern Kansas, south through Arkansas, Oklahoma and Texas.)

178. Black of head extending over from 1 to 4 transverse rows of dorsal scales (Fig. 54)..... *T. nigriceps* Kennicott.

(Central and southern Texas, north into Kansas, west to southwestern Utah, south through Arizona and probably into northern Mexico.)

Black of head extending over 5 or 6 transverse rows of dorsal scales . . . . . *T. planiceps* (Blainville). (Southern Lower California.)

179. One or more preoculars (Fig. 56) 180
No preocular, loreal in contact with eye (Fig. 57) 182

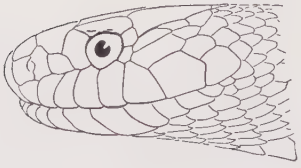

Fig. 56. *Elaphe vulpina*

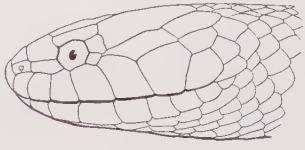

Fig. 57. *Farancia abacura*

180. Pupil round; head but slightly wider than neck; only a single preocular (Fig. 56) 181
Pupil vertically elliptical; head distinctly wider than neck; two or three preoculars (Fig. 58) 183

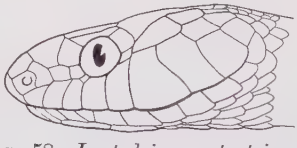

Fig. 58. *Leptodeira septentrionalis*

181. Scale rows, 25–33; posterior teeth in upper jaw not enlarged and not grooved . . . . . Elaphe. 44
Scale rows, 19; posterior teeth in upper jaw enlarged and grooved; pattern of two broad light stripes on either side of the mid-dorsal line (or these largely suffused with brown); rest of dorsal surface brown, belly light and immaculate, or specked with black. *Coniophanes imperialis* (Baird).
(Extreme southern Texas to Guatemala.)

182. Dark above, no stripes or spots, red of belly usually extending onto 2 or 3 lower rows of scales at regular intervals; a single internasal; usually 8 lower labials (Figs. 57, 59). Horn snake.
Farancia abacura (Holbrook).
(Virginia to Florida and eastern Texas, north in the Mississippi Valley to southern Indiana.)

Brown above, a light stripe on the sixth or seventh row of scales on each side and one on the mid-dorsal row; belly with two lateral and usually a median row of dark spots, distinguishable at least anteriorly; two internasals; usually 9 or 10 lower labials. Rainbow snake..... *Abastor erythrogrammus* (Daudin).
(Coastal regions from southeastern Virginia to northern Florida and Alabama.)

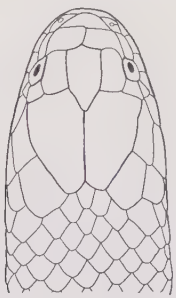

Fig. 59. *Farancia abacura*

183. Upper labials, 8; 1 loreal; 2 postoculars; a single anterior temporal (Fig. 58)..... 184

Upper labials, 9; usually 2 loreals; 3 or 4 postoculars; 2 or 3 anterior temporals; posterior teeth of upper jaw enlarged and grooved; about 21–32 double dorsal blotches on body.... *Trimorphodon lyrophanes* (Cope).
(Southern Arizona, southern California, Lower California, and probably northwestern Mexico.)

184. A considerable number of small dorsal blotches with

one or two series of smaller alternating spots on sides; 21 rows of scales; posterior teeth of upper jaw not grooved.....*Hypsiglena ochrorhynchus* Cope. (Central Texas to northern Utah and San Francisco Bay, south throughout Lower California and to central Mexico.)

About 22–26 large dorsal blotches, sometimes more or less confluent, without lateral alternating spots; scale rows, 23, occasionally 21; posterior teeth of upper jaw grooved (Fig. 58).

Leptodeira septentrionalis (Kennicott).

(Extreme southern Texas to Honduras.)

185. A black ring followed by a yellow one immediately behind head; black of head extending back only onto anterior ends of parietals; dorsal red areas usually strongly spotted with black, and often interrupted on belly by a large black spot; usually 3 or 4 black rings on tail; caudals, 28–45

Micrurus fulvius (Linné).

(Eastern North Carolina, south through Florida, west through Alabama to southeastern Missouri, south through eastern Texas to Panama.)

A yellow followed by a red ring immediately behind head; black of head extending back beyond middle of parietals; dorsal red areas little if at all spotted with black, and not at all or but slightly marked with black on the belly; 2 black rings on tail; caudals, 21–29.....*M. euryxanthus* (Kennicott). (Southern Arizona, northern Mexico, and Tiburon Island, Lower California.)

186. A rattle on end of tail (Fig. 60)..... 188
No rattle on end of tail (Fig. 61).....Agkistrodon 187

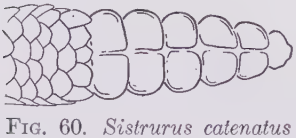

Fig. 60. *Sistrurus catenatus*

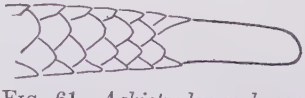

Fig. 61. *Agkistrodon mokasen*

187. No loreal; supralabials in contact with orbit; scale rows, 25; a pair of post-parietals. Water moccasin; cotton-mouth (Fig. 62).....*A. piscivorus* (Lacépède). (Lowlands from southeastern Virginia through Florida, north in the Mississippi Valley to southeastern Missouri and southern Illinois, west to central Texas and up the Rio Grande to the Pecos River.)
Loreal present; orbit separated from supralabials by scales; scale rows usually 23; no post-parietals (Fig. 63). Copperhead.....*A. mokasen* Beauvois. (Southern New Hampshire to central Illinois, west to middle Kansas and the Texas Panhandle, and south through Texas and northern Florida.)

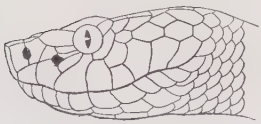

Fig. 62. *Agkistrodon piscivorus* (from Stejneger)

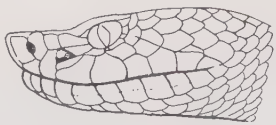

Fig. 63. *Agkistrodon mokasen* (from Baird)

188. Top of head with large plates arranged symmetrically (Fig. 64).....Sistrurus. 189
Top of head with small scales, mostly unsymmetrical (Fig. 65).....Crotalus. 191

Fig. 64. *Sistrurus catenatus catenatus*

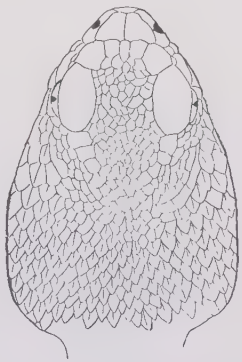

Fig. 65. *Crotalus horridus* (from Baird)

189. Prefrontals not in contact with the loreal proper (lower loreal, if two be present); a whitish stripe from posterior nasal below eye to angle of mouth. 190
Prefrontals in contact with loreal proper; a whitish stripe from below center of eye to angle of mouth.
Sistrurus miliarius (Linné).
(Southeastern North Carolina, south throughout Florida, west through eastern Texas and Oklahoma, and north through Arkansas to southern Missouri.)

190. Scale rows usually 25. Massasauga.
S. catenatus catenatus (Rafinesque).
(Southern peninsula of Michigan, Ontario, and western New York, southwest to Kansas.)
Scale rows usually 23.
S. catenatus edwardsii (Baird & Girard).
(Western Kansas, south through western Texas, and west to southeastern Arizona.)

191. Anterior nasal in contact with rostral (Fig. 66)..... 192
Anterior nasal separated from rostral by small scales (Fig. 67). Bleached rattlesnake.
Crotalus mitchellii (Cope).
(Arizona, southeastern California, and Lower California.)

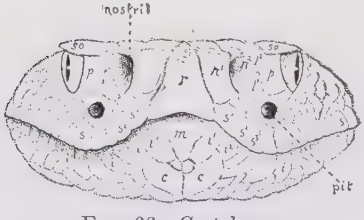

Fig. 66. *Crotalus sp.*
(from Stejneger)

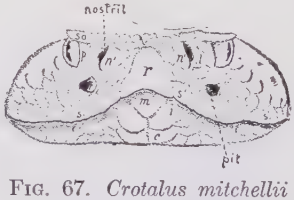

Fig. 67. *Crotalus mitchellii*
(from Stejneger)

192. Upper preocular large, wider than high (Fig. 68)..... 193
Upper preocular small and higher than wide or about square; a pattern of about 16–18 transverse black-

ish bands usually distinguishable; general color greenish (Fig. 69). Green rattlesnake.

C. lepidus (Kennicott).

(Border region in Texas, New Mexico, southeastern Arizona and adjacent Mexico.)

FIG. 68. *Crotalus sp.* (from Stejneger)

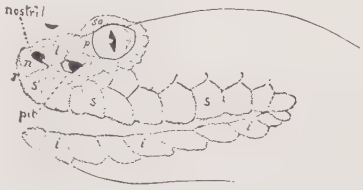

FIG. 69. *Crotalus lepidus* (from Stejneger)

193. External border of supraocular not produced into a horn-like process (Fig. 70) 194

External border of supraocular produced into a horn-like process (Fig. 71). Sidewinder; horned rattlesnake ..... *C. cerastes* Hallowell.

(Southern California, southern Nevada, Arizona, southwestern Utah and northeastern Lower California.)

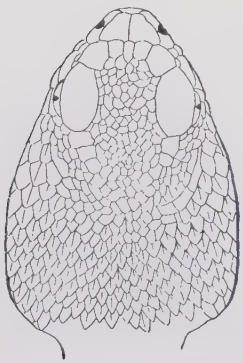

FIG. 70. *Crotalus horridus* (from Stejneger)

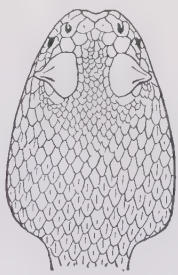

FIG. 71. *Crotalus cerastes* (from Stejneger)

194. Eye separated from upper labials by 2–5 rows of small scales; upper labials more than 9 (Fig. 68)..... 195
Eye separated from upper labials by a single row of small scales; upper labials, 9; a dorsal pattern of numerous small blotches, often broken into two's. *C. pricei* Van Denburgh.
(Southeastern Arizona and adjacent region in Mexico.)

195. Pattern not essentially of short transverse bands of white..... 196
A dorsal pattern of about 19–23 more or less obscure short transverse bands of white, narrowly edged with black; general color above light olive-brown. *C. willardi* Meek.
(Northwestern Mexico to the Santa Rita Mountains, Arizona.)

196. Dark spots on back solid, or with only one median light spot..... 197
Dark spots on back with two symmetrical light spots, one on each side of median line; tail nearly uniformly black.....*C. molossus* Baird & Girard.
(Western Texas to southern Arizona, northern Mexico, and San Esteban Island, Gulf of California.)

197. Dorsal pattern consisting of more or less squarish spots or straight cross-bands..... 198
Dorsal pattern consisting of dark chevron-shaped bands.....*C. horridus* (Linné).
(Maine to Georgia, westward to Great Plains.)

198. Rostral at least as high as wide (Fig. 72)..... 200
Rostral wider than high (Fig. 73)..... 199

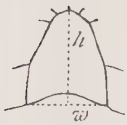

FIG. 72.
Diagram of high rostral
(from Stejneger)

FIG. 73.
Diagram of low rostral
(from Stejneger)

199. Keels on all the body scales, except sometimes the first row; head scales nearly smooth; colors pale; lateral angles of dorsal hexagons without black apex.
C. tigris Kennicott.
(Southern California, southern Nevada and southern Arizona.)

Four or 5 rows of smooth scales on each side; head scales strongly keeled; colors bright; lateral angles of dorsal hexagons with black apex.....*C. enyo* (Cope).
(Extreme southern Lower California.)

200. Light post-superciliary line reaching second scale row above mouth at least two scales anterior to angle of mouth (Fig. 74)..... 202

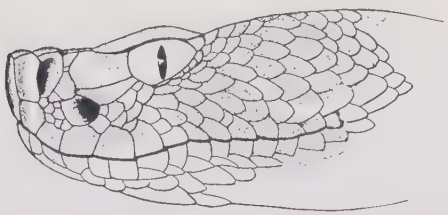

FIG. 74. *Crotalus adamanteus* (from Stejneger)

Light post-superciliary line reaching second scale row above angle of mouth, or not at all (Figs. 75, 76).. 201

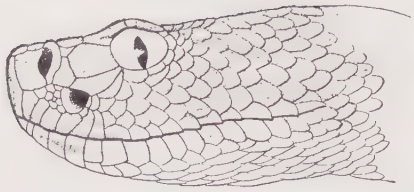

FIG. 75.
Crotalus confluentus (from Stejneger)

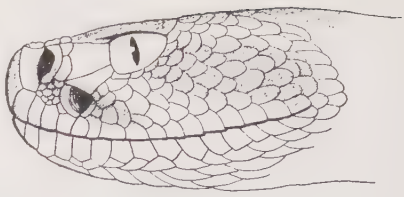

FIG. 76.
Crotalus oreganus (from Stejneger)

201. Light post-superciliary line one scale wide; dark postocular patch starting from below anterior edge of eye.....*C. confluentus* Say.
(Great Plains from 96th meridian to Rockies, and from southern Canada to Texas.)

Light post-superciliary line two scales wide; dark postocular patch starting from below center of eye.
C. oreganus Holbrook.
(British Columbia to southern California, western Idaho and Nevada and northwestern Lower California.)

202. No white line on first labial and nasal, which are uniform in color and more or less dusted over with minute blackish dots..... 203

A well defined vertical white line on first labial and anterior nasal, occupying the posterior half of the latter (Fig. 77).....*C. adamanteus* Beauvois.

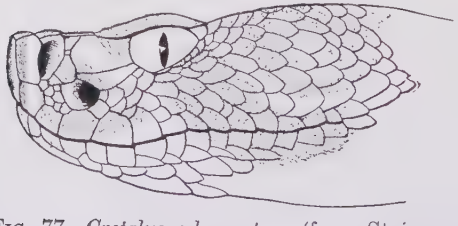

FIG. 77. *Crotalus adamanteus* (from Stejneger)

(Southern North Carolina to Florida, westward to Louisiana.)

203. Dorsal rhombs only imperfectly or not at all outlined with light borders; sides without definite markings. 204

Dorsal rhombs enclosed by continuous yellow borders; sides clouded or blotched with brown, more or less indefinitely outlined with light yellow or white.

C. atrox lucasensis (Van Denburgh).

(Southern Lower California.)

204. First supralabial usually not divided; general coloration grayish or brownish; markings less definite, more punctulate; dorsal blotches usually not completely surrounded by light margins..... 205

First supralabial usually divided transversely; general coloration reddish, pinkish, or yellowish. . *C. exul* Garman.

(Southern and Lower California, except the Cape Region, Cerros Island and islands in the Gulf of California.)

205. Dorsal rhombs usually not enclosing light lateral areas.

C. atrox atrox (Baird & Girard).

(Texas and northern Mexico to Arizona and northeastern Lower California.)

Dorsal rhombs usually enclosing light lateral areas as pale as the ground color.

C. tortugensis Van Denburgh & Slevin.

(Tortuga Island, Gulf of California.)

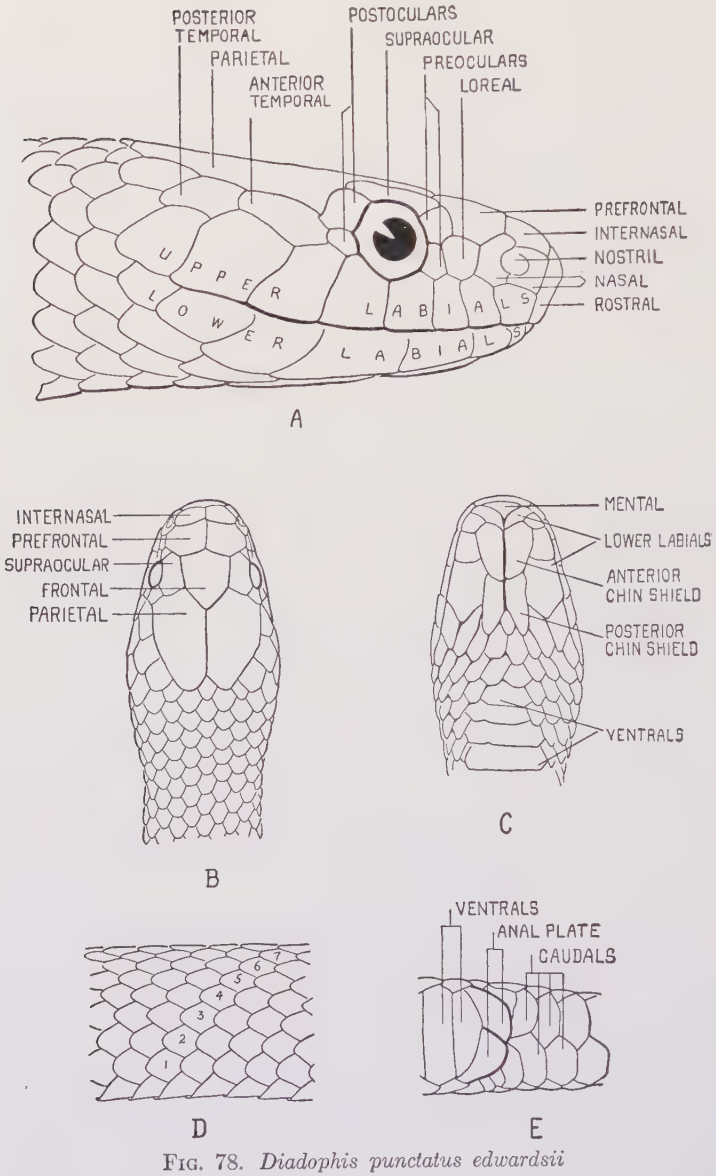

FIG. 78. *Diadophis punctatus edwardsii*

GLOSSARY

Anal plate. — The scale lying just in front of the anus, sometimes a single large scale ("anal entire," or "anal undivided"), sometimes divided obliquely into two scales ("anal divided"). See Fig. 78E.

Body. — From head to anus.

Caudals. — Large scales on under side of tail, usually in two series (divided, Fig. 78E), but in some snakes in only a single series (entire).

Caudal scales. — *See* Caudals.

Chin-shields. — Paired, elongated scales on chin between lower labials; usually two pairs, an anterior and a posterior (Fig. 78C), but the posterior pair is, in a few snakes, greatly reduced.

Fang. — A tooth of the upper jaw with a lengthwise groove on its anterior edge, or with a canal opening on the anterior face of the tooth near its tip. A fang is usually decidedly larger than the ungrooved teeth accompanying it.

Frontal. — A median, unpaired plate on top of head between eyes (Fig. 78B).

Internasals. — Two plates (in a few snakes only one) on top of head just behind rostral (Fig. 78B).

Keel. — A median longitudinal ridge on a scale (Fig. 9).

Labials, lower. — A row of scales bordering the lower jaw on each side and separated from one another at the anterior tip of the jaw by a mental scale (Fig. 78A, C).

Labials, upper. — A row of scales bordering the upper jaw on each side, and separated from each other at the anterior point of the head by the rostral plate (Fig. 78A).

Loreal. — A small scale lying between the nasal scale and the preoculars (Fig. 78A).

Nasal. — The scale in which the nostril lies. The nasal is said to be "entire" when the nostril is in the center of a large scale, and "divided" when it lies between two squarish scales or largely in one of them (Fig. 78A). In the latter case the anterior half is called the "anterior nasal" and the posterior half the "posterior nasal."

Nasal plate. — *See* Nasal.

Nostril. — A lateral pit on anterior portion of head on each side (Fig. 78A).

Parietals. — Two large plates on top of head posteriorly (Fig. 78A, B).

Postocular. — One or more small scales directly behind eye (Fig. 78A).

Prefrontals. — Two scales (four in Pituophis) on top of anterior part of head just in front of the unpaired frontal plate (Fig. 78 A, B).

Preocular. — One or more small scales directly in front of eye (Fig. 78 A). If the scale in this position is much longer than high, it is called the loreal, in which case the preocular is absent (Fig. 22).

Rostral. — A plate of varying shape at extreme anterior point of head above mouth (Fig. 78 A).

Scale rows. — The lines of dorsal scales, counted obliquely (Fig. 78 D). The number may vary from one end of the body to the other, but the maximum number is always meant (unless otherwise stated), and this is determined by counting the rows somewhat anterior to the middle of the body, or by making several such counts. Scale rows, or scale formula, 19–21–17, means 19 rows at anterior end of body, a maximum of 21 rows, near the middle, and a minimum of 17 rows, at the posterior end. By a "higher" formula is meant one showing a greater number of scale rows. Thus, 23–19 is a higher formula than 21–17, and the latter is higher than 19–21–17. A "lower" formula than the last would be such a one as 19–17 or 17–19–15.

Sex. — Sex is definitely determined by dissection of under side of tail behind anus. A slit an inch or less in length will reveal, in the male, a hollow, spiny organ lying ventral to the scent gland; in the female, only the scent gland will be found here. Sex is often also determinable by the shape of the base of the tail, which is wide in the male, narrow and more quickly tapering in the female.

Suboculars. — Small scales between eye and upper labials in a few snakes (Fig. 24).

Supraocular. — A plate lying just above the eye, between the latter and the frontal plate (Fig. 78 A, B).

Tail. — The part of the animal posterior to the anus.

Temporal, anterior. — One or two (occasionally more) longitudinally elongated scales, arranged one above another, behind postoculars and between parietals and upper labials (Fig. 78 A).

Temporal, posterior. — One, two, three, or more longitudinally elongated scales, lying one above another, behind the anterior temporals and between the parietals and upper labials (Fig. 78 A).

Ventrals. — Large scales on lower surface of body between head and anal plate (Fig. 78 C, E).

Ventral scales. — *See* Ventrals.

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Abbreviations are as follows: A. M. N. H., American Museum of Natural History; Cornell Univ., Zoölogy Department of Cornell University; U. of M., Museum of Zoölogy of the University of Michigan; U. S. N. M., United States National Museum.

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